Effect of platelet activation on disaggregating shear stress in red blood cells aggregation

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Red Blood Cell (RBC) aggregation and platelet activation are considered as major determinants for vascular diseases. However, the relation between hemorheological properties of RBC and platelet activity has not been fully understood. Thus, in this study, we investigated the effect of platelet activation on hemorheological characteristics of RBC-related parameters such as Critical Shear Stress (CSS), Aggregation Index (AI) and Elongation Index (EI). We hypothesized that activated platelet by high shear would affect the strength of RBC aggregation such as elevated CSS. Shear flow was generated by a rotating stirrer which remotely controlled with rotating magnet on the top of a rotor. For experiments, Shear stimulation was applied at 2800rpm for 30sec to both of samples which are whole blood sample and negative blood sample without platelets. As a result, CSS of whole blood was elevated from 181 to 229mPa (SD=±48mPa). In contrast, negative blood sample excluding platelets did not show relevant increase. In addition, AI and EI did not show apparent changes regardless of application of shear stimulation. Consequently, our findings would imply that RBC aggregation should be considered with platelet activation and further study to investigate detailed mechanism among RBC characteristics and platelet activation has to be defined.

Keywords: CSS, Red blood cell, aggregation, platelet, shear